Lab Code: 200167-0

FCC PART 90

TEST AND MEASUREMENT REPORT

For

Pyramid Communications

15182 Triton Lane, Suite 102,

Huntington Beach, CA 92649, USA

FCC ID: LRUSVR-200U

Report Type:	**Product Type:**
CIIPC Report	UHF Radio Base

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Report Number:	R1012205-90CIIPC
Report Date:	2010-12-23
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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1012205-90CIIPC	Original Report	2010-12-23

1. General Information

1.1 Product Description for Equipment under Test (EUT)

The report has been prepared on behalf of *Pyramid Communications* and their product *FCC ID: LRUSVR-200U*, model: SVR-250U or the EUT as referred to in the rest of this report. The EUT is a UHF Radio Base which operates at 400~512 MHz Band.

1.2 Mechanical Description

The EUT measures approximately 180mm (L) x 203.2 mm (W) x 57.1545 mm (H) and weighs 1020.6 g.

The test data gathered are from production sample, serial number: 6500774 provided by the manufacture.

1.3 Objective

This Type approval report is prepared on behalf of *Pyramid Communications* in accordance with Part 2 and Part 90 of the Federal Communication Commissions rules.

1.4 Related Submittal(s)/Grant(s)

Pyramid report: LRU-SVR-200U Exhibit F & G

1.5 Test Methodology

All tests and measurements indicated in this document were performed in accordance with the Code of federal Regulations Title 47 Part 2, Sub-part J as well as the following individual parts:

Part 90 – Private Land Mobile Radio Service

Applicable Standards: TIA-603-C and ANSI 63.4-2003, American National Standard for Method of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

All emissions measurement was performed by Bay Area Compliance Laboratories Corp. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

1.6 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in the field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the values ranging from ± 2.0 dB for Conducted Emissions tests and ± 4.0 dB for Radiated Emissions tests are the most accurate estimates pertaining to uncertainty of EMC measurements at BACL Corp.

Detailed instrumentation measurement uncertainties can be found in BACL Corp. report QAP-018.

1.7 Test Facility

The test site used by BACL Corp. to collect radiated and conducted emissions measurement data is located at its facility in Sunnyvale, California, USA.

The test sites at BACL have been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports has been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997 and Article 8 of the VCCI regulations on December 25, 1997. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2003.

The Federal Communications Commission, Industry Canada, and Voluntary Control Council for Interference has the reports on file and is listed under FCC registration number: 90464, IC registration number: 3062A, and VCCI Registration Number: C-2463 and R-2698. The test site has been approved by the FCC, IC, and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, BACL is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (Lab Code 200167-0). The current scope of accreditations can be found at http://ts.nist.gov/ts/htdocs/210/214/scopes/2001670.htm.

2 System Test Configuration

2.1 Justification

The EUT was configured for testing according to TIA/EIA-603-C.

The EUT was tested in the normal (native) operating mode to represent *worst*-case results during the final qualification test.

2.2 EUT Exercise Software

Software was provided by the Client.

2.3 Equipment Modifications

No modifications were made to the EUT.

2.4 Local Support Equipment

Manufacturer	Description	Model No.	Serial No.
Dell	Laptop	Inspiron 300m	-

2.5 Internal Configuration

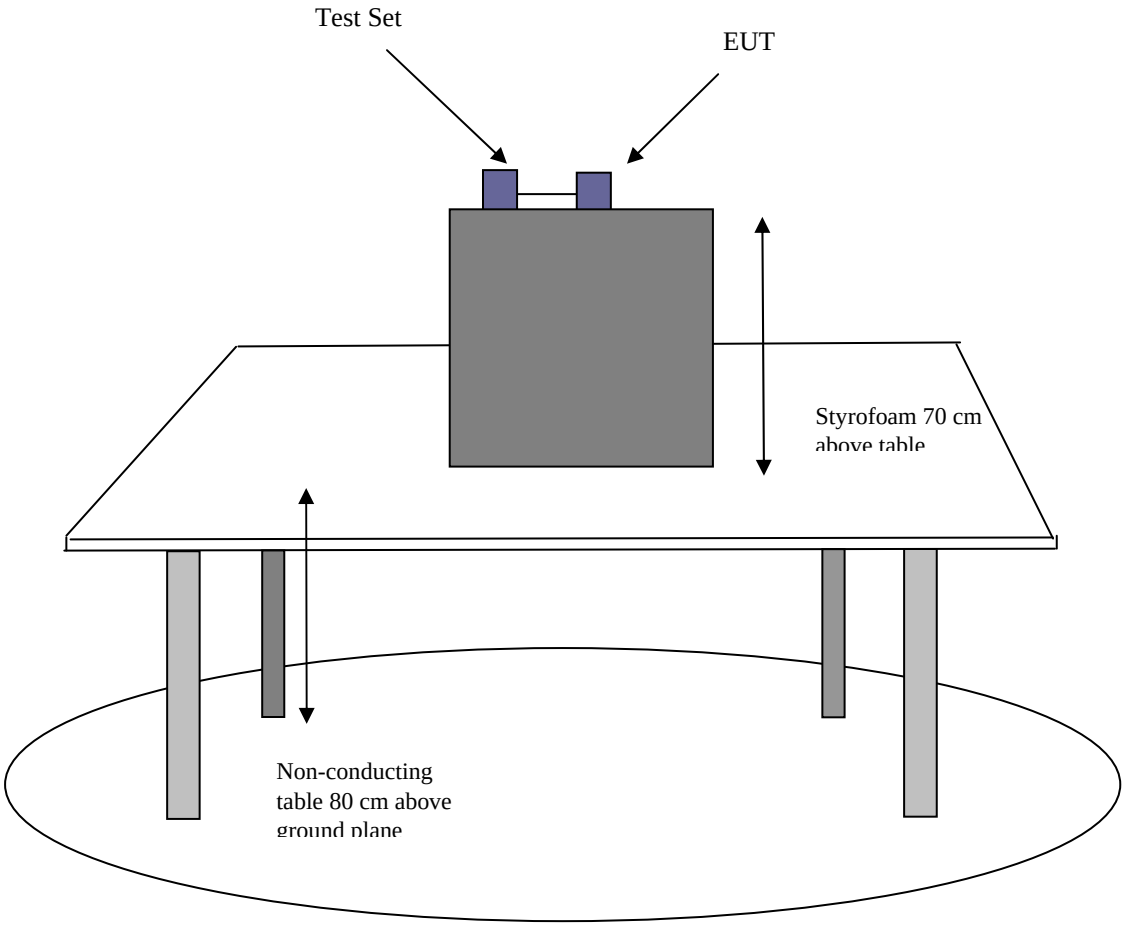
Manufacturer	Description	Model No.	Serial No.
Pyramid Communications	PCB Board	RVB MOB DEV Rev E	-

2.6 Interface Ports and Cabling

N/A

2.7 Test Setup Block Diagram

Radiated Test



3 Summary of Test Results

FCC Rules	Description of Test	Result
§1.1310, §2.1091	RF Exposure Information	Compliant
§2.1046, §90.205	RF Output Power	Compliant*
§2.1047, §90.207	Modulation Characteristics, Audio Frequency Response and Audio Filter Response	Compliant*
§2.1049, §90.209/90.210	Occupied Bandwidth and Emission Mask	Compliant*
§2.1051, §90.210	Spurious Emissions at Antenna Terminals	Compliant*
§2.1055, § 90.213	Frequency Stability	Compliant*
§2.1053, §90.210	Field strength of Spurious Radiation	Compliant
§ 90.214	Transient Frequency Behavior	Compliant*

Note: Compliant* please reefer to Pyramid report: LRU-SVR-200U Exhibit F & G

4 FCC §2.1091 - RF Exposure Information

4.1 Applicable Standards

FCC §2.1091

(a) Requirements of this section are a consequence of Commission responsibilities under the National Environmental Policy Act to evaluate the environmental significance of its actions. See subpart I of part 1 of this chapter, in particular §1.1307(b).

According to §1.1310 and §2.1091 RF exposure is calculated.

Limits for Exposure

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Averaging Time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3-3.0	614	1.63	*(100)	6
3.0-30	1842/f	4.89/f	*($900/f^2$)	6
30-300	61.4	0.163	1.0	6
300-1500	/	/	f/300	6
1500-100,00	/	/	5.0	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	30
1.34-30	842/f	2.19/f	*($180/f^2$)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

f = frequency in MHz
* = Plane-wave equivalent power density

Note 1 to Table 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

Note 2 to Table 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

Antenna:

The manufacturer does not specify an antenna. A typical vehicle antenna has a gain of 3 dBi was used with this device. This device has provisions for operation in a vehicle, or a fixed location.

Operating Configuration and exposure conditions:

Device category: Mobile per Part 2.1091

Environment: Controlled Exposure

Typical use qualifies for a maximum duty cycle factor of 50%. The manufacturer also markets this device only for occupation use.

MPE Prediction

Predication of MPE limit at a given distance, Equation from OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2$$

Where: S = power density
P = power input to antenna
G = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna

Maximum peak output power at antenna input terminal (dBm):	33.32
Maximum peak output power at antenna input terminal (mW):	2150
Maximum output power at antenna input terminal with 50% Duty Cycle (mW):	1075
Prediction distance (cm):	20
Prediction frequency (MHz):	460.6
Maximum Antenna Gain, typical (dBi):	3.0
Maximum Antenna Gain (numeric):	2.0
Power density of prediction frequency at 20 cm (mW/cm^2):	0.428
MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.535

Conclusion

The device complies with the MPE requirements by providing a safe separation distance of 20 cm between the antenna, including any radiating structure, and any persons when normally operated.

5 FCC §2.1046 & §90.205 – RF Output Power

5.1 Applicable Standard

According to FCC §2.1046, and §90.205, maximum ERP is dependent upon the station's antenna HAAT and required service area.

5.2 Test Procedure

The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.

Spectrum Analyzer Setting:

RBW	Video BW
100 kHz	300 kHz

5.3 Test Result

Refers to Pyramid report: LRU-SVR-200U Exhibit F & G

6 FCC §2.1047 & §90.207 – Modulation Characteristic

6.1 Applicable Standard

FCC §2.1047 & §90.207:

(a) Equipment which utilizes voice modulated communication shall show the frequency response of the audio modulating circuit over a range of 100 to 5000 Hz. for equipment which is required to have a low pass filter, the frequency response of the filter, or all of the circuitry installed between the modulation limited and the modulated stage shall be supplied.
(b) Equipment which employs modulation limiting, a curve showing the percentage of modulation versus the modulation input voltage shall be supplied.

6.2 Test Procedure

Test Method: TIA/EIA-603-C 2.2.3

6.3 Test Result

Refers to Pyramid report: LRU-SVR-200U Exhibit F & G

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7 FCC §2.1049 & §90.209/210– Occupied Bandwidth & Emission Mask

7.1 Applicable Standard

FCC §90.209

Operations using equipment using a 25 kHz bandwidth will be authorized a 20 kHz bandwidth. Operations using equipment designed to operate with a 12.5 kHz channel bandwidth will be authorized an 11.25 kHz bandwidth.

FCC §2.1049, §90.210

Emission Mask B. For transmitters that are equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as follows:

1) On any frequency removed from the assigned frequency by more than 50 percent, but not more than 100 percent of the authorized bandwidth: At least 25 dB.

2) On any frequency removed from the assigned frequency by more than 100 percent, but not more than 250 percent of the authorized bandwidth: At least 35 dB.

3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least 43 + log (P) dB.

The resolution bandwidth was 100Hz or greater for measuring up to 250 kHz from the edge of the authorized frequency segment, and 30kHz or greater for measuring more than 250 kHz from the authorized frequency segment.

Emission Mask D—12.5 kHz channel bandwidth equipment. For transmitters designed to operate with a 12.5 kHz channel bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:

1) For any frequency removed from the center of the authorized bandwidth f_0 to 5.625 kHz removed from f_0, 0dB.

2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 5.626kHz but no more than 12.5 kHz, at least 7.27 (f_d –2.88 kHz) dB.

3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 12.5 kHz at least:

50+10logP=50+10log (P) or 70 dB, whichever is the lesser attenuation.

7.2 Test Procedure

The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.

The resolution bandwidth of the spectrum analyzer was set at 100 Hz and the spectrum was recorded in the frequency band ±50 KHz from the carrier frequency.

7.3 Test Result

Refers to Pyramid report: LRU-SVR-200U Exhibit F & G

8 FCC §2.1051 & §90.210 - Spurious Emissions at Antenna Terminals

8.1 Applicable Standard

FCC §90.210 (12.5 kHz bandwidth only)

On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 12.5kHz at least:

50+10logP or 70 dB

FCC §2.1051and §90.210 (25 kHz bandwidth and 20 kHz bandwidth)

On any frequency removed from the center of the assigned channel by more than 250 percent at least:

43+10log (P)

8.2 Test Procedure

The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 100 kHz. Sufficient scans were taken to show any out of band emissions up to 10^{th} harmonic.

8.3 Test Results

Refers to Pyramid report: LRU-SVR-200U Exhibit F & G

9 FCC §2.1055 (d) & §90.213 - Frequency Stability

9.1 Applicable Standard

FCC §2.1055 (d), §90.213

In the 400-512 MHz band, mobile stations designed to operate with a 12.5 kHz channel bandwidth or designed to operate on a frequency specifically designated for itinerant use or designed for low-power operation of two watts or less, must have a frequency stability of 2.5 ppm.

9.2 Test Procedure

Frequency Stability vs. Temperature: The equipment under test was connected to an external DC power supply and the RF output was connected to the Spectrum Analyzer via feed-through attenuators. The EUT was placed inside the temperature chamber. The DC leads and RF output cable exited the chamber through an opening made for the purpose.

After the temperature stabilized for approximately 20 minutes, the frequency output was recorded from the Spectrum Analyzer.

Frequency Stability vs. Voltage: An external variable DC power supply Source. The voltage was set to 110% of the nominal value and was then decreased until the transmitter light no longer illuminated; i.e., the end point. The output frequency was recorded for each voltage.

9.3 Test Result

Refers to Pyramid report: LRU-SVR-200U Exhibit F & G

10 FCC §2.1053 & §90.210 – Field Strength of Spurious Radiation

10.1 Applicable Standard

FCC §2.1053 (a) Measurements shall be made to detect spurious emissions that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data shall be supplied showing the magnitude of each harmonic and other spurious emission. For this test, single sideband, independent sideband, and controlled carrier transmitters shall be modulated under the conditions specified in paragraph (c) of §2.1049, as appropriate. And §90.210(b),(d): Except as indicated elsewhere in this part, transmitters used in the radio services governed by this part must comply with the emission masks outlined in this section. Unless otherwise stated, per paragraphs (d)(4), (e)(4), and (m) of this section, measurements of emission power can be expressed in either peak or average values provided that emission powers are expressed with the same parameters used to specify the unmodulated transmitter carrier power. For transmitters that do not produce a full power unmodulated carrier, reference to the unmodulated transmitter carrier power refers to the total power contained in the channel bandwidth. Unless indicated elsewhere in this part, the table in this section specifies the emission masks for equipment operating in the frequency bands governed under this part.

10.2 Test Procedure

The transmitter was placed on a Styrofoam with wooden turntable, and it was normal transmitting with 50ohm termination which was also placed on the turntable.

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.

The frequency range up to tenth harmonic of the fundamental frequency was investigated.

Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

Spurious emissions in dB = 10 lg (TXpwr in Watts/0.001) – the absolute level

10.3 Test Environmental Conditions

Temperature:	26 °C
Relative Humidity:	43 %
ATM Pressure:	101.7 kPa

The testing was performed by Kevin Li on 2010-12-22 in 5 meter chamber 3.

10.4 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100337	2010-03-24
Agilent	Spectrum Analyzer	E4440A	US45303156	2010-08-09
Sunol Science Corp	System Controller	SC99V	122303-1	N/R
Sunol Science Corp	Combination Antenna	JB3	A0020106-2	2010-08-06
Hewlett Packard	Pre amplifier	8447D	2944A06639	2010-06-18
A.R.A Inc	Horn antenna	DRG-1181A	1132	2010-11-29
Mini-Circuits	Pre Amplifier	ZVA-183-S	570400946	2010-05-10

Statement of Traceability: BACL attests that all calibrations have been performed per the NVLAP requirements, traceable to NIST.

10.5 Test Results

Test Mode: Transmission Using substitution method

For 12.5 kHz Channel Spacing:

Indicated		Turntable Azimuth degrees	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Freq. (MHz)	Amp. (dBuV)		Height (cm)	Polar (H/V)	Freq. (MHz)	Level (dBm)	Ant. Cord. (dBi)	Cable Loss (dB)	Absolute Level (dBm)		
920	58.11	348	136	H	920	-30.64	0	0.66	-31.3	-20	-11.3
920	58.11	329	144	V	920	-25.86	0	0.66	-26.52	-20	-6.52

For 25 kHz Channel Spacing:

Indicated		Turntable Azimuth degrees	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Freq. (MHz)	Amp. (dBuV)		Height (cm)	Polar (H/V)	Freq. (MHz)	Level (dBm)	Ant. Cord. (dBi)	Cable Loss (dB)	Absolute Level (dBm)		
920	59.81	115	163	H	920	-28.94	0	0.66	-29.6	-13	-16.6
920	57.15	21	100	V	920	-26.82	0	0.66	-27.48	-13	-14.48

11 FCC §90.214 - Transient Frequency Behavior

11.1 Applicable Standard

FCC §90.214: Transmitters designed to operate in the 150–174 MHz and 421–512 MHz frequency bands must maintain transient frequencies within the maximum frequency difference limits during the time intervals indicated:

Time intervals[1,2]	Maximum frequency difference[3]	All equipment
		421 to 512 MHz
Transient Frequency Behavior for Equipment Designed to Operate on 25 kHz Channels		
t_1[4]	±25.0 kHz	10.0 ms
t_2	±12.5 kHz	25.0 ms
t_3[4]	±25.0 kHz	10.0 ms
Transient Frequency Behavior for Equipment Designed to Operate on 12.5 kHz Channels		
t_1[4]	±12.5 kHz	10.0 ms
t_2	±6.25 kHz	25.0 ms
t_3[4]	±12.5 kHz	10.0 ms

11.2 Test Procedure

TIA/EIA-603-C 2.2.19

11.3 Test Results

Refers to Pyramid report: LRU-SVR-200U Exhibit F & G